DOE/ID-11031
Revision 0
October 2002

U.S. Department of Energy
Idaho Operations Office

New Pump and Treatment Facility Remedial Action Report, Test Area North Final Groundwater Remediation, Operable Unit 1-07B

INEEL
Home of Science and Engineering Solutions
Idaho National Engineering and Environmental Laboratory

DOE/ID-11031
Revision 0

New Pump and Treatment Facility Remedial Action Report, Test Area North Final Groundwater Remediation, Operable Unit 1-07B

Gary D. Mecham
Kesley K. Kimmell

October 2002

Prepared for the
U.S. Department of Energy
Idaho Operations Office

ABSTRACT

This remedial action report discusses the New Pump and Treatment Facility (NPTF) as the final remedial component for the medial zone of the contaminated groundwater plume at Test Area North. The NPTF began full-scale operations in October 2001 after completion of the final inspection in October 2001. These operations were considered early implementation of Phase C in accordance with the Operable Unit 1-07B Record of Decision. The scope of this report focuses on the NPTF portion of the remedy and includes discussion on the results of operational testing, shakedown period, inspections, evaluations of effectiveness, and an explanation of necessary changes to the remedial design and controlling documents.

CONTENTS

FIGURES

TABLES

ACRONYMS

DCE	dichloroethene
DOE-ID	Department of Energy Idaho Operations Office
ESD	explanation of significant differences
F&OR	Functional and Operational Requirement
FFA/CO	Federal Facility Agreement and Consent Order
GWTF	Groundwater Treatment Facility
I/O	input/output
INEEL	Idaho National Engineering and Environmental Laboratory
ISB	in situ bioremediation
MCL	maximum contaminant level
MNA	monitored natural attenuation
NPTF	New Pump and Treat Facility
O&M	operation and maintenance
OU	operable unit
PCE	tetrachloroethene
PLC	programmable logic controller
RA	remedial action
RAWP	remedial action work plan
RD	remedial design
ROD	Record of Decision
SO	system operability
TAN	Test Area North
TCE	trichloroethene
TPR	technical procedure
TSF	Technical Support Facility

VC	vinyl chloride
VOC	volatile organic compound
WCE	well characterization and evaluation

New Pump and Treatment Facility Remedial Action Report, Test Area North Final Groundwater Remediation, Operable Unit 1-07B

1. INTRODUCTION

This remedial action report is prepared in accordance with the Idaho National Engineering and Environmental Laboratory (INEEL) *Federal Facility Agreement and Consent Order* (FFA/CO) (DOE-ID 1991) by Department of Energy Idaho Operations Office (DOE-ID). This report discusses the implementation of the pump and treat medial zone remedial action (RA) for the Test Area North (TAN) contaminated groundwater plume ([Technical Support Facility] TSF-23), designated Operable Unit (OU) 1-07B. This report was prepared in support of the *Phase C Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B* (DOE-ID 1999) and in accordance with the *Remedial Design/Remedial Action Scope of Work Test Area North Final Groundwater Remediation Operable Unit 1-07B* (DOE-ID 2001a).

This report discusses the activities performed in efforts to bring the New Pump and Treat Facility (NPTF) to a fully operational status. These activities included operational testing, shakedown operations, operational inspections, and final inspection issue resolution.

1.1 Technical Support Facility History

From about 1953 to 1972, liquid wastes generated at TAN, including organic, inorganic, and low-level radioactive wastewaters were disposed of by injecting them into Injection Well TSF-05. These injected wastes spread within the Snake River Plain Aquifer underlying the INEEL site. Over time, this created a contaminated groundwater plume originating from TSF-05, first detected as low levels of two volatile organic compounds (VOCs), trichloroethene (TCE) and tetrachloroethene (PCE), in 1987.

As documented in the *Record of Decision (ROD), Declaration for Technical Support Facility Injection Well and Surrounding Groundwater Contamination and Miscellaneous No Action Sites Final Remedial Action, Operable Unit 1-07B* (DOE-ID 1995), the Agencies began an interim action, OU 1-07A, which included constructing and operating the Groundwater Treatment Facility (GWTF) and monitoring aquifer parameters from groundwater extraction and new monitoring wells.

A remedial investigation and feasibility study for OU 1-07B was completed in 1994 which characterized the extent and nature of the contamination (EG&G 1994). Concurrently, the OU 1-07A interim action was initiated for cleanup of the source material. In the ROD, signed in August 1995 (DOE-ID 1995), pump and treat was selected to restore the contaminated aquifer, as well as allowing concurrent treatability studies to be conducted for alternative technology evaluation. These activities were to be completed in three phases. With the signing of the 1995 ROD, Phase A began and started the transition from the OU 1-07A interim action to the OU 1-07B final remedial action. Phase B began in 1996 with pump and treat containment of the hotspot using the GWTF and also included the initiation of treatability studies for five alternate technologies.

Phase C is the implementation of the final selected remedy to be used for aquifer cleanup based on the results of the treatability studies. As documented in the *Explanation of Significant Differences (ESD) from Record of Decision for TSF Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action* (INEEL 1997), pump and treat was determined to be the final selected remedy for the "medial" zone within the OU 1-07B contaminated plume. As explained in the ESD, the medial zone is defined as the area contained within the 1,000-µg/L isopleth line for TCE concentrations and outside the 20,000-µg/L isopleth line. Design, construction, and operation of the NPTF was initiated and provided for early implementation of Phase C. These activities were undertaken prior to the final decisions for treatment of hotspot and distal portions of the OU 1-07B contaminated plume. In the 2001 *ROD Amendment* (DOE-ID 2001b), clarification was given for the remedial components at the hotspot and distal zone, however requirements for operation of the NPTF were still retained in the 1995 ROD (DOE-ID 1995).

1.2 Reporting Responsibilities

The purpose of this report is to provide the information needed to show that the NPTF is operational and functional. This report also will address items and activities that have taken place since the completion of the NPTF final inspection.

In accordance with Section 2.13 of the *Federal Facility Agreement and Consent Order Action Plan* (DOE-ID 1991) and as outlined in the *Phase C Remedial Action Work Plan (RAWP)* (DOE-ID 1999), this report provides

- Summary of RA components as defined in the RAWP (DOE-ID 1999)
- Summary of the results of operational testing, the shakedown period, and the operational inspections
- A description and documentation of the closure of outstanding action items from the final inspection report
- Explanation of any modifications to the RAWP (DOE-ID 1999) needed as a result of the shakedown operations
- Evaluation of the effectiveness in meeting treatment system performance requirements
- Summary of data collected during the RA that supports a determination that the remedy is operational and functional
- Certification that the remedy is operational and functional.

As a result of the submittal of this remedial action report, a revision to the *Phase C RAWP for TAN Final Groundwater Remediation, OU 1-07B* (DOE-ID 1999) is being recommended.

2. OBJECTIVES AND SCOPE

As documented in the ROD (DOE-ID 1995) and RAWP (DOE-ID 1999), the NPTF provided early implementation of Phase C remediation for the contaminated groundwater plume at TAN. The NPTF design requirements were documented in the *Functional and Operational Requirements for the New Pump and Treat Facility at Test Area North Operable Unit 1-07B* (INEEL 1998a). Along with the RAWP, the Functional and Operational Requirements (F&ORs) provided the basis for the remedial design (RD) of the NPTF. During the construction, testing, and inspection of the NPTF, several changes were necessary to the design of the NPTF. The following sections describe the original design requirements, changes made to the design, and associated changes needed for the RAWP.

2.1 Original Design Requirements

The F&ORs (INEEL 1998a) provided general, mechanical, and process requirements to be used when designing the NPTF. The following were the general requirements defined for the NPTF:

- The facility will initiate dissolved phase cleanup in the medial zone of the TAN contaminated groundwater plume by pumping and treating the water using air stripping technology.
- The facility will operate 24 hours a day, 7 days per week, and have a 30-year operating life.
- The facility will be able to maintain unmanned operations.
- Facility uptime will be ≥ 90%.
- An enclosure shall be constructed to protect the system from environmental exposure and freeze protection.
- All contaminated water, prior to treatment, will include double containment systems with automatic leak detection for interstitial zones between primary and secondary containment components.
- An integrated emergency shutdown system shall integrate all blowers, motors, and operating equipment, as well as an emergency notification system for abnormal operating conditions.
- The NPTF shall be designed to treat groundwater with influent concentrations of 1,100 µg/L TCE, 70 µg/L PCE, 120 µg/L cis-dochloroethene (DCE), and 50 µg/L trans-DCE.
- The NPTF will not provide radionuclide removal and/or treatment.
- The NPTF will be designed and constructed to accommodate a variable flowrate of 150 to 250 gpm.
- Effluent water from the NPTF must be treated to below maximum contaminant levels (MCLs).
- Air emissions from the NPTF must be maintained below 0.18 lb/hr TCE, 4.9 lb/hr PCE, 564.3 lb/hr cis-DCE, 0.33 lb/hr vinyl chloride (VC), as set in the NPTF F&ORs.

2.2 Design and Documentation Changes

The *New Pump and Treat Facility Final Inspection Report* (INEEL 2001a) discusses and provides the basis for changes made to the remedial design of the NPTF from the initial submission of the 90% design to the as-built setup as of the final inspection in September 2001. Of those, the following design changes require changes to the RAWP (DOE-ID 1999).

2.2.1 Extraction Pump

After construction of the extraction wells, well characterization and evaluation (WCE) activities were performed to evaluate hydraulic characteristics. The *Well Characterization and Evaluation Report Supporting Functional and Operational Requirements for the New Pump and Treat Facility at Test Area North Operable Unit 1-07B* (INEEL 1998b) was used to determine the design influent flowrate of the NPTF. It was shown that the required NPTF capture zone could be established with a pumping rate of 107 gpm at Well TAN-40. During the preparation of the F&ORs, this base requirement was given a safety margin and conservatively raised to 150 gpm. During construction, it was found that the P-40 extraction pump (specified in the design) was no longer in production, so an alternate pump was selected and installed. During system testing, it was determined that the P-40 pump could not meet the specified 150-gpm flowrate. Water level drawdown measurements obtained during the testing, showed that when pumping at 120 gpm the system did in fact establish an adequate capture zone to meet the cleanup objectives of the NPTF (see Appendix D in the *Final Inspection Report* [INEEL 2001a]). Therefore, the minimum operating flowrate for the NPTF was changed to 120 gpm.

Although this design requirement change did not require the design itself to change, the controlling documentation (Phase C RAWP, DOE-ID 1999) will need to be changed to reflect the operational requirement for a minimum flowrate of 120 gpm.

2.2.2 Air Stripper Efficiency

During operational testing, sampling showed that the air strippers were not obtaining the necessary removal efficiency for the VOCs. To remedy this, an additional tray was added on each air stripper unit. This improved the VOC removal efficiency to levels required by the original F&OR process requirements to meet the allowable discharge criteria.

This change has been incorporated into the remedial design, with no additional changes needed in the controlling documentation.

2.2.3 Cumulative Risk

The NPTF must treat contaminated water to less than 1×10^{-5} cumulative risk. The *NPTF Operation and Maintenance (O&M) Plan* (DOE-ID 2002) was originally submitted without addressing the cumulative risk calculation. In November 2001, Revision 2 provided the basis for how cumulative risk would be calculated. No additional document changes are needed for this issue.

2.2.4 Purge Water

Activities including in situ bioremediation (ISB) sampling, monitored natural attenuation (MNA) sampling, NPTF performance monitoring sampling, and well redevelopment create purge water that must be processed through the NPTF. This purge water must be processed so that concentrations of radionuclides reinjected into the aquifer are less than the applicable MCL. Purge water injection procedures have been incorporated into the NPTF operations technical procedures (TPRs), as stated in the *NPTF O&M Plan* (DOE-ID 2002). No additional document changes are needed to address this issue.

2.2.5 Title Revision

Originally, the *Phase C RAWP* (DOE-ID 1999) was written to cover all areas of the remedial action and would be updated as each remedy was brought online. However, as discussed in the 2001 *ROD Amendment* (DOE-ID 2001B), the remedial action was separated into three different remedies, each with very different characteristics and requirements. Because of this, the scope for the first *Phase C RAWP* will be changed to NPTF RAWP for TAN Final Groundwater Remediation, OU 1-07B, with each follow-on remedy (ISB and MNA) having a separate RAWP.

3. DISCUSSION OF REMEDY PREPARATIONS

This section provides a summary of the results obtained from operational testing, shakedown operations, and the operational inspections. Along with this discussion, documentation will be provided addressing the open action items that resulted from the final inspection.

3.1 System Operability Testing

Once construction of the NPTF was complete, system operability (SO) testing was performed on each of the major components of the system. The SO test was performed in accordance with TPR-6488, "TAN OU 1-07B NPTF System Operability Test." All components operated as required and operating set points were incorporated into the system control components as documented in the *New Pump and Treat Facility Operations and Maintenance Manual Volume I* (INEEL 2001b).

3.2 Prefinal Inspection

On April 9-10, 2001, the agency prefinal inspection was held. During the inspection, controlling and supporting documentation was reviewed, a walkdown of the facility was performed, and a hot test was successfully completed. After the successful hot test, agreement was received to proceed with shakedown operations. Results and open-items of the prefinal inspection can be found in Appendix A of the *NPTF Final Inspection Report* (INEEL 2001a).

3.3 Initial Shakedown Operations

At the startup of shakedown operations, components that could not be tested with potable water (extraction pumps, air stripper efficiency, capture zone, etc.) were tested. This also included successfully testing the ability to process purge water from OU 1-07B monitoring wells.

During the initial shakedown operations, monitoring of the air strippers showed that they were not able to obtain the required TCE removal efficiency. After evaluating several options, an additional tray was added to each air stripper unit. Samples taken after the fifth tray was added, showed that the air strippers met the design requirement for TCE removal efficiency, requiring no further action. The VOC monitoring data can be found in Appendix C of the *NPTF Final Inspection Report* (INEEL 2001a).

Drawdown tests during this phase demonstrated that acceptable drawdown could be measured in the OU 1-07B monitoring wells while operating at 120 gpm, as opposed to the original 150 gpm. Extraction Pump P-40 was able to maintain this extraction flowrate and shows with the model that using this pump alone will capture all particles within the boundaries of the medial zone. See Appendix D of the *NPTF Final Inspection Report* (INEEL 2001a) for particle tracking modeling results. After the drawdown tests, Pump P-40 was replaced with one that is now capable of pumping more than 150 gpm.

3.4 Final Inspection

On September 6, 2001, the Agencies performed the final inspection. During this inspection, all of the resolutions to open items from the prefinal inspection were reviewed, followed by a walkdown inspection of the modified NPTF. Based on this final inspection, the Agencies agreed that the NPTF could begin full-scale operations.

For the remaining open items, discussions were held to determine the interim actions to be taken until a final resolution could be implemented. As shown in Table 3-1, the only two items remaining open at the final inspection were the missing well safety posts and the problem of roof drainage.

Table 3-1. Open items resolutions.

Item No.	Description	Interim Action	Final Resolution
4 x 3	MW-33 and other wells were missing safety posts.	All groundwater monitoring wells associated with OU 1-07B activities were inspected to determine which were missing safety posts. Those wells that did not have safety posts around them (TAN-53A and TAN-42) were immediately cordoned off with fencing until safety posts could be installed.	All 46 wells previously missing safety posts have had them installed, as shown in the attached photographs (see Appendix B), or concrete barriers have been put in place (TAN-53A) to protect the wells.
4 x 18	Roof slope drains onto equipment (transmitter and sensors) and exterior piping with building connection. Area is not sloped to facilitate drainage away from building.	The daily inspection procedure was modified to include an inspection of this area to ensure the depth of any accumulation remained at least 2 in. below the building curbing. Any snow accumulation higher than the exterior thermocouples was also to be removed within 24 hr.	A drainage ditch from the accumulation area down the hill to the existing drainage path in front of the NPTF has been designed. Details are shown in Appendix A.

4. FULL-SCALE OPERATIONS

The NPTF has been in operation since October 2001, and through the month of August maintained a 98% uptime. The following sections discuss the data supporting the determination of this remedial action report that the NPTF is operational and functional.

4.1 Facility Operational Parameters

During the time the NPTF has been in full-scale operations, several pumping scenarios have been utilized for processing contaminated groundwater. Figure 4-1 shows the extraction well flowrates utilized. The horizontal line in the figure represents the minimum flowrate (120 gpm) required for ensuring capture of the entire plume. Operational flowrates at all times were above this flowrate.

During operations of the NPTF, a few shutdowns were experienced. Table 4-1 summarizes the issues involved, the amount of downtime experienced, and the resolution taken for each. The NPTF has achieved 100% uptime since April 2002.

Table 4-1. Problems observed.

Month (Week)	Issue	Downtime	Resolution
October	TSF area power outage	7 hr	Pigeon tripped breaker. Breaker was reset.
November (11/12) December (12/17)	High-high level alarm in the air strippers	6 hr 11 hr	Wires into the programmable logic controller (PLC) were twisted so as to cause stress on the connection. Stress was removed and the connection was tightened. System was reset and all components appeared to operate normally.
December (12/31) January (1/7)	Input/output (I/O) board/PLC failure	85 hr (total)	Faulty I/0 board was found and replaced. (This was probably a result of having the capacitance probe in place for the high-high water level switches in the air stripper.)
March (3/4)	Dielectric union and pump (TAN-40) failure	12 hr	Pump was replaced with 150S150-8, which is capable of higher flowrates.
April (4/8) April (4/15) April (4/22)	High-high level alarm in the air strippers	3 hr 12 hr 11 hr	Water level switches were giving intermittent false indications for high water level in air strippers. This appeared to be a problem with the ultrasonic level switches. When switches were removed, it was found that the switches installed had conductance probes instead of the specified ultrasonic probes. Spare ultrasonic switches were installed.

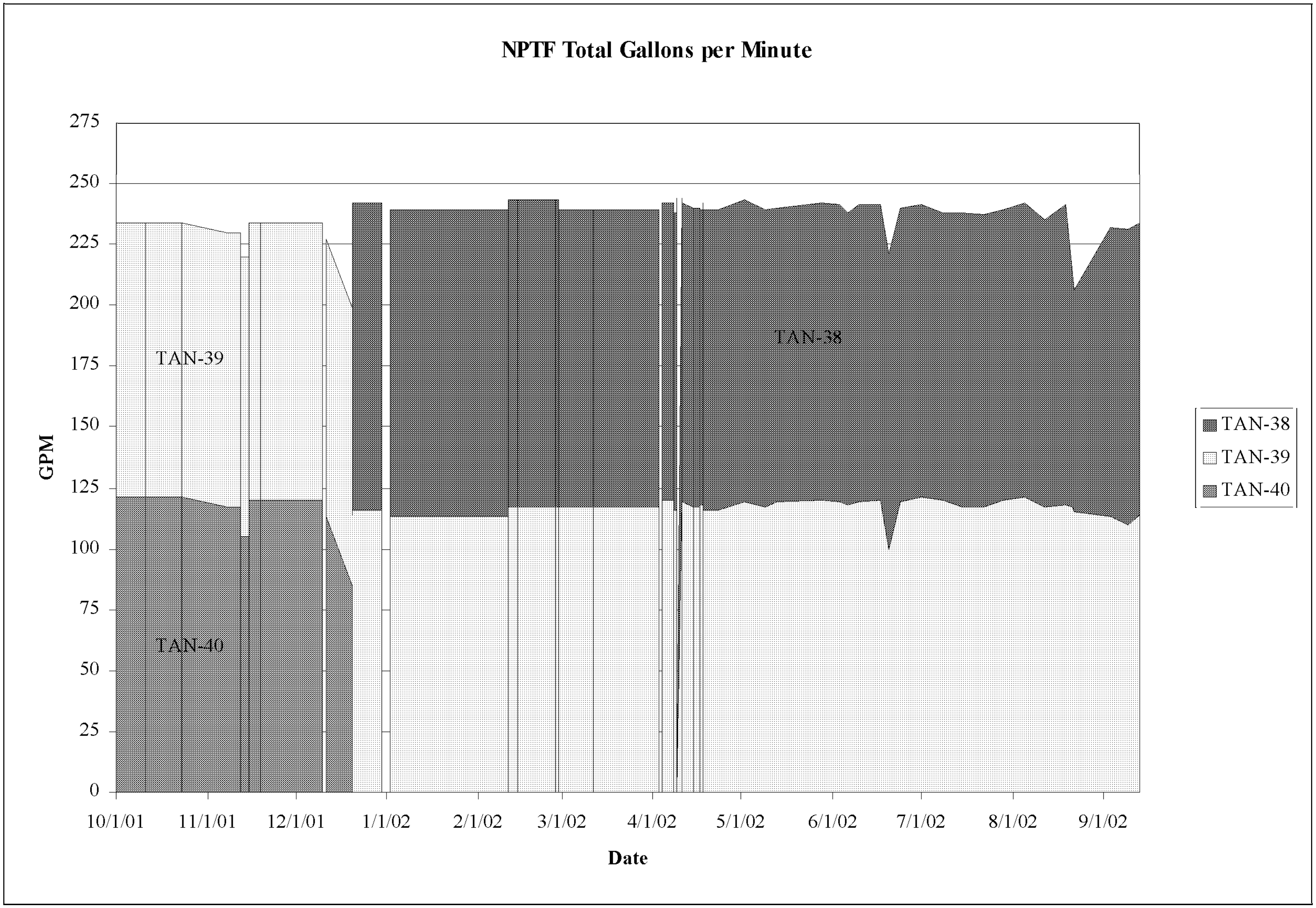


Figure 4-1. Extraction well flowrates.

4.2 Facility Effectiveness

4.2.1 Effluent Concentrations

As required by the 1995 ROD (DOE-ID 1995) and F&ORs (INEEL 1998a), effluent water injected into the aquifer must be below MCLs while maintaining air emissions below levels listed in Section 2 of this report. Sampling data, included in Table 4-2, shows the influent concentration, effluent concentration, and average air discharge rate by month. The calculated discharge rate was less than the allowable limit for all contaminants.

Table 4-2. Compliance sampling data.

	Influent Concentration (μg/L)				Effluent Concentration (μg/L)				Calculated Discharge Rate (lb/hr)				
Month	TCE	t-DCE	c-DCE	PCE	TCE	t-DCE	c-DCE	PCE	TCE	t-DCE	c-DCE	PCE	VC
October	310D			26	5U			5U	0.028	0.00081	0.0023	0.0014	ND
November	260D	14J	18J	35J	0.9J	2U	2U	2U	0.034	0.00974	0.0029	0.0027	ND
December	380D	8	21	23	2U	2U	2U	2U	0.035	0.00078	0.0024	0.0028	ND
January	340J	6J	18J	24J	0.9J	2U	2U	2U	0.027	0.00058	0.0015	0.0027	ND
February	280D	5	14	23	2U	2U	2U	2U	0.017	0.00034	0.0010	0.0019	ND
March	230D	4	12	18	1.0	1U	1U	1U	0.019	0.00033	0.0010	0.0019	ND
April	210	4	12	19	0.6J	1U	1U	1U	0.020	0.00031	0.0010	0.0020	ND
May	210	3	9	17	1U	1U	1U	1U	0.017	0.00029	0.0009	0.0018	ND
June	160D	2	7	12	0.9J	1U	1U	1U	0.016	0.00026	0.0009	0.0018	ND
Limit									0.180	564.3[a]		4.9	0.33

a. Limit is set for combined t-DCE and c-DCE.

D = diluted sample J = estimated value U = non-detect

4.2.2 Cumulative Risk Calculation

In accordance with Appendix C of the *NPTF O&M Plan* (DOE-ID 2002), the cumulative carcinogenic risk calculations were performed for the effluent water of the NPTF. The calculated values are shown in Table 4-3. The calculated cumulative risk for NPTF effluent was below the no-longer contained-in requirement of 1×10^{-5}.

Table 4-3. Monthly cumulative risk values.

Month	Cumulative Risk
October	0
November	6.92×10^{-7}
December	0
January	6.92×10^{-7}
February	0
March	7.69×10^{-7}
April	4.62×10^{-7}
May	0
June	6.92×10^{-7}

4.2.3 Drawdown Data

Daily water level fluctuations are the result of barometric pressure changes, whereas gradual changes over longer periods of time are attributed to seasonal water table variations that can be as great as 4 ft. Measured drawdowns for each of the three extraction wells during this operating period were within the range expected based upon the results of the WCE (INEEL 1998b). A periodic representation of the drawdown levels is shown in Tables 4-4 through 4-6. Figures 4-2 through 4-4 display water level drawdown data from Extraction Wells TAN-38, -39, and -40. Each chart graphically illustrates pumping activity and NPTF downtime.

Table 4-4. Measured drawdown and pumping rates from TAN-38.

Date	Drawdown (ft)	Rate (gpm)
12/20/01	1.16	126
01/02/02	1.20	126
02/11/02	1.22	126
02/27/02	1.22	126
03/12/02	1.31	122

Table 4-5. Measured drawdown and pumping rates from TAN-39.

Date	Drawdown (ft)	Rate (gpm)
10/01/01	0.89	113
11/12/01	0.93	115
01/02/02	0.99	113
02/14/02	1.00	117
03/12/02	1.05	117

Table 4-6. Measured drawdown and pumping rates from TAN-40.

Date	Drawdown (ft)	Rate (gpm)
10/01/01	1.22	121
10/23/01	1.26	121
11/12/01	1.02	105
11/15/01	1.08	120
12/11/01	1.03	113

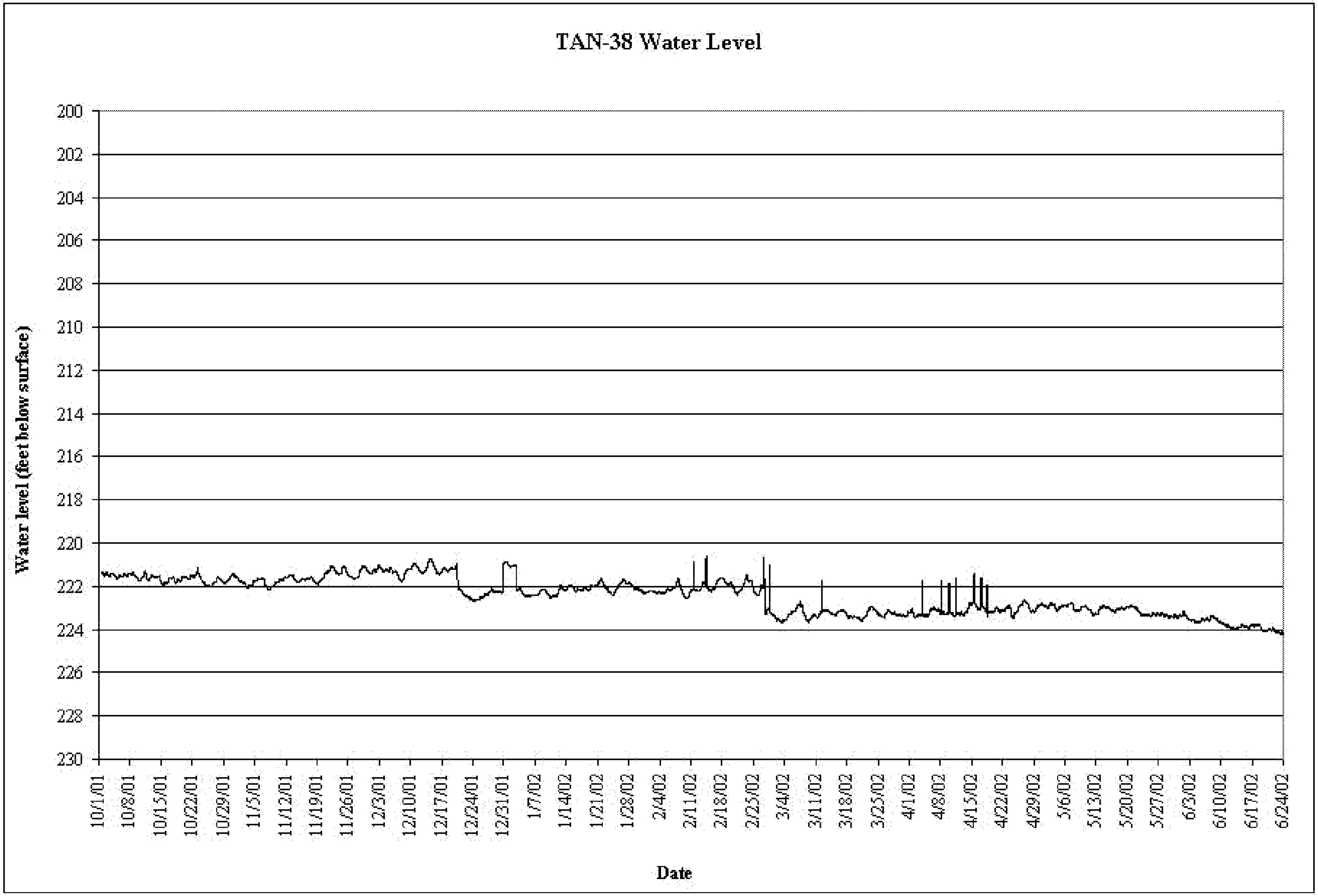


Figure 4-2. TAN-38 water levels.

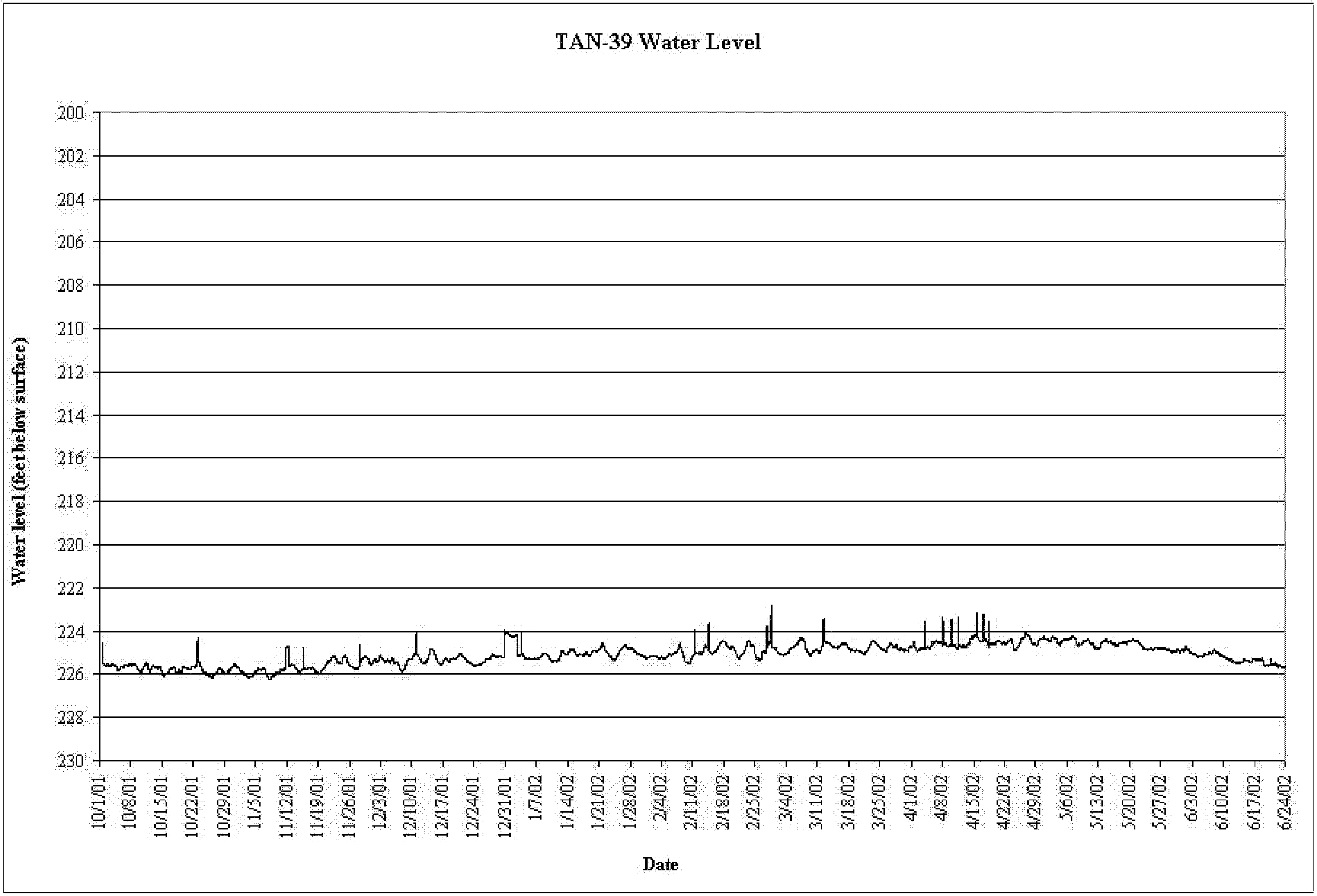


Figure 4-3. TAN-39 water levels.

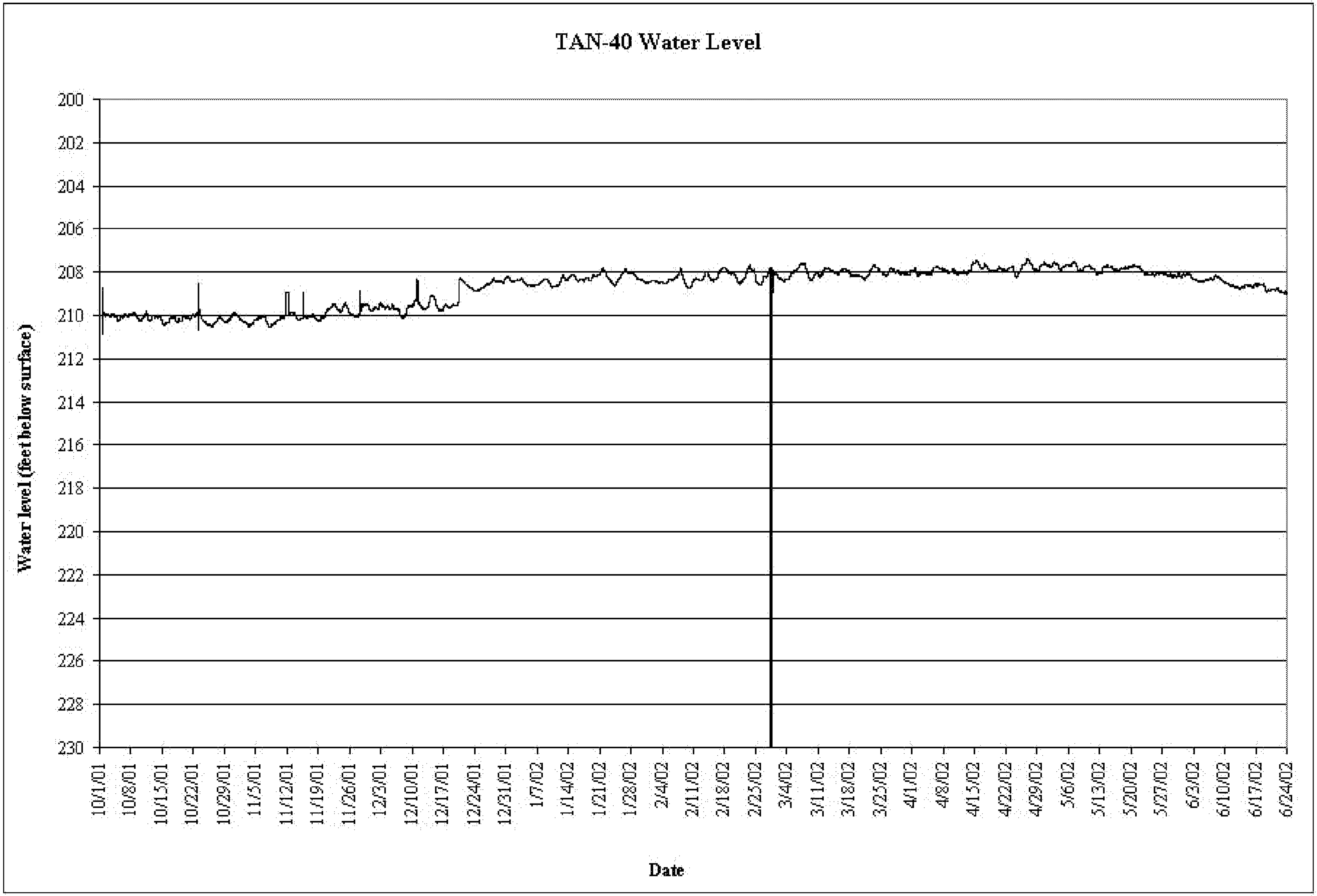


Figure 4-4. TAN-40 water levels.

Figure 4-5 displays the water level data from the Injection Well TAN-53A. As with Figures 4-2 through 4-4, daily random fluctuations are the result of barometric pressure changes, whereas gradual changes over longer periods of time are largely due to seasonal water table variations. The vertical downward lines on the figure mark system downtimes when no water was injected (NPTF experiencing downtime). A mounding event was observed from the end of October until the beginning of January, after which the water depth below surface remained relatively consistent. This observation is indicative of normal aquifer reaction to the injection of entrained air. A plugging mechanism related to air entrainment is caused by a release of dissolved gasses within the aquifer formation after injection resulting in reduced permeability. Assuming injection variables remain constant (e.g., pumping rate, degree of saturation, water quality, etc.), the water level will continue to rise until pressure equalization occurs (Pyne 1995).

Drawdown data were also collected from nearby monitoring wells to show that the pumping flowrates were sufficient to produce a closed hydraulic head contour at least equal to the width of the medial zone, as discussed in the *NPTF O&M Plan* (DOE-ID 2002). The width is defined as the length of a line drawn perpendicular to the southern boundary of the medial zone, intersecting TAN-40, which is 300 ft. The required capture zone has been established as 150% of the width of the medial zone or 450 ft. A drawdown test was conducted on December 11, 2001, which involved the pumping from both TAN-39 (114 gpm) and TAN-40 (113 gpm). Selected drawdown data are given in Table 4-7.

The results from this drawdown test confirm that NPTF operations create a capture zone that exceeds the width of the medial zone. Based on the drawdown measurements at TAN-32, the width of the capture zone is 604 ft; which is much greater than the required capture zone of 450 ft.

Table 4-7. December 11, 2001, measured drawdown test.

Well	Drawdown (ft)	Distance from TAN-40 (ft)
TAN-40	0.964	0
TAN-41	0.312	20
TAN-34	0.155	141
TAN-32	0.022	302

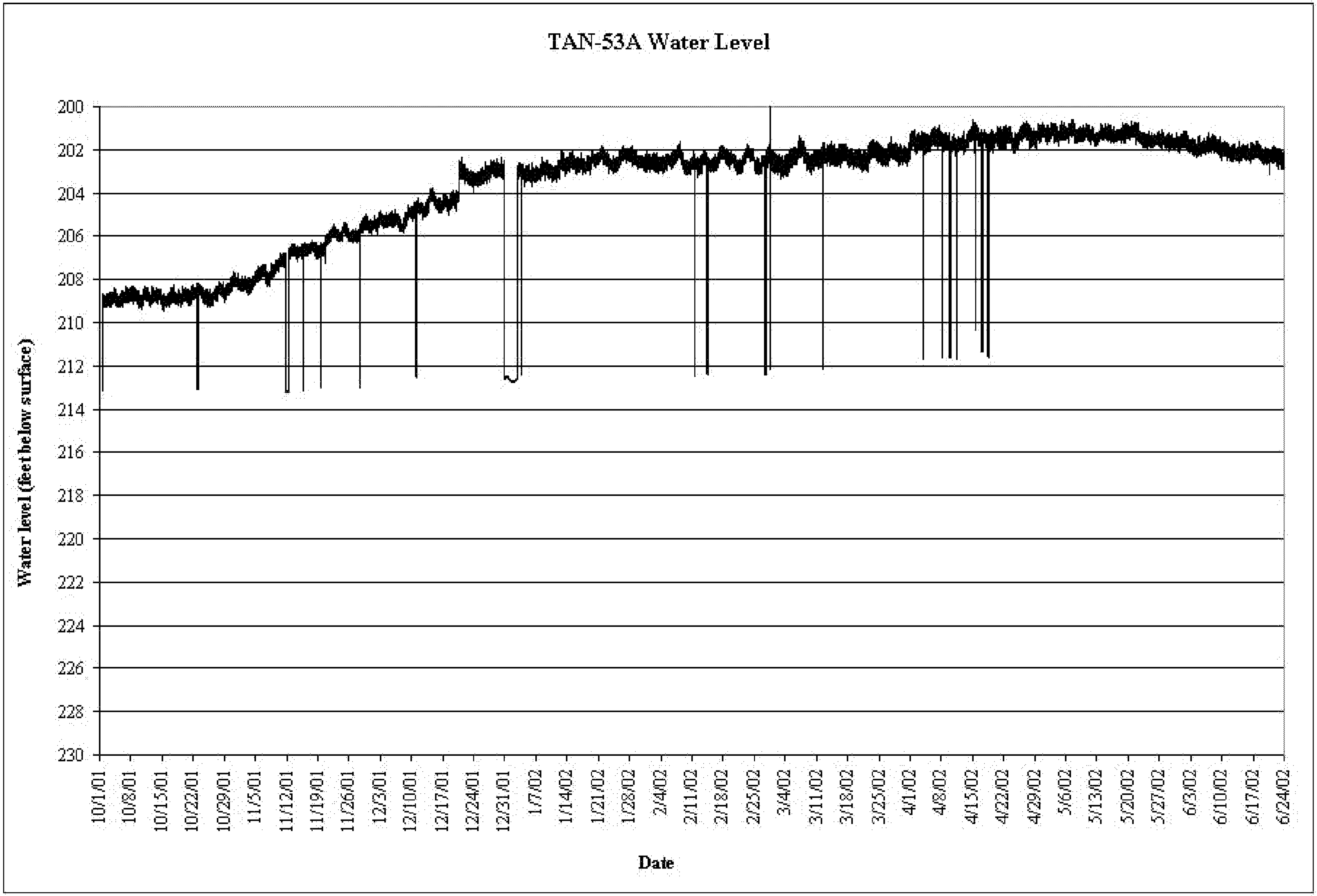


Figure 4-5. TAN-53A water levels.

5. CONCLUSIONS

After completion of the NPTF in early 2001, operability testing and agency inspections demonstrated that the facility met performance requirements outlined in the RAWP (DOE-ID 1999) and was ready to start full-scale operations. Operations began on October 1, 2001. Through July 2002, the NPTF has operated with a 98% uptime and has met all system operational requirements.

5.1 Operational and Functional Determination

As shown in the information presented in the previous sections, the NPTF has met the requirements outlined in the 1995 ROD (DOE-ID 1995), F&ORs (INEEL 1998a), and RAWP (DOE-ID 1999). As a result, this remedial action report certifies the NPTF as operational and functional in accordance with the FFA/CO (DOE-ID 1991).

5.2 Remedial Action Work Plan

The RAWP (DOE-ID 1999) is the controlling document that provides guidance for the NPTF remedial action activities. As a result of changes made during construction and based on initial operations, it is recommended that the RAWP be revised to include the minimum flowrate of 120 gpm and a cumulative risk of $a \times 10^{-5}$ as discussed in Section 2.2.

Other text changes are needed as a result of the *ROD Amendment* (DOE-ID 2001b), which changed the final remedies to be used for the remediation of the hotspot area and the distal zone. These changes include making the title NPTF-specific, and will not impact or change any of the NPTF operational requirements.

6. REFERENCES

DOE-ID, 1991, *Federal Facility Agreement and Consent Order Action Plan*, U.S. Department of Energy Idaho Operations Office, U.S. Environmental Protection Agency Region 10, State of Idaho Department of Health and Welfare, 1088-06-29-120, December 1991.

DOE-ID, 1995, *Record of Decision, Declaration for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites Final Remedial Action, Operable Unit 1-07B*, U.S. Department of Energy Idaho Operations Office, DOE-ID/10139, August 1995.

DOE-ID, 1999, *Phase C Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B*, U.S. Department of Energy Idaho Operations Office, DOE/ID-10679, Rev. 0, October 1999.

DOE-ID, 2001a, *Remedial Design/Remedial Action Scope of Work, Test Area North Final Groundwater Remediation, Operable Unit 1-07B,* U.S. Department of Energy Idaho Operations Office, DOE/ID10905, Rev. 1, November 2001.

DOE-ID, 2001b, *Record of Decision Amendment, Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action*, U.S. Department of Energy Idaho Operations Office, DOE/ID-10139, Rev. 0, September 2001.

DOE-ID, 2002, *Phase C Operations and Maintenance Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B*, U.S. Department of Energy Idaho Operations Office, DOE/ID-10684, Rev. 2, May 2002.

EG&G, 1994, *Remedial Investigation Final Report with Addenda for the Test Area North Groundwater Operable Unit 1-07B at the Idaho National Engineering Laboratory,* Rev. 0, January 1994.

INEEL, 1997, *Explanation of Significant Differences from Record of Decision (ROD) for TSF Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action*, Idaho National Engineering and Environmental Laboratory, INEEL/EXT-97-00931, Rev. 0, November 1997.

INEEL, 1998a, *Functional and Operational Requirements for the New Pump and Treat Facility at Test Area North Operable Unit 1-07B*, Idaho National Engineering and Environmental Laboratory, INEEL/EXT-97-01335, Rev. 1, September 1998.

INEEL, 1998b, *Well Characterization and Evaluation Report Supporting Functional and Operational Requirements for the New Pump and Treat Facility at Test Area North Operable Unit 1-07B*, Idaho National Engineering and Environmental Laboratory, INEEL/EXT-97-01356, Rev. 0, January 1998.

INEEL, 2001a, *New Pump and Treat Facility Final Inspection Report*, Idaho National Engineering and Environmental Laboratory, INEEL/EXT-01-01292, Rev. 0, September 2001.

INEEL, 2001b, *New Pump and Treat Facility Operations and Maintenance Manual Volume I*, Idaho National Engineering and Environmental Laboratory, INEEL/EXT-2000-00930, Rev. 1, November 2001.

Pyne, David G., 1995, *Groundwater Recharge and Wells, A Guide to Aquifer Storage Recovery*, Boca Raton: Lewis Publishers.

Appendix A

Drainage Design

Appendix A

Drainage

Excess collection of surface water runoff has demonstrated the need for better drainage around the NPTF building. The attached grading plan and supporting calculations provide for drainage at the anticipated flowrates by providing cutoff ditches to capture and reroute the flow, and a catch basin and culvert to discharge the flow into an existing drainage ditch.

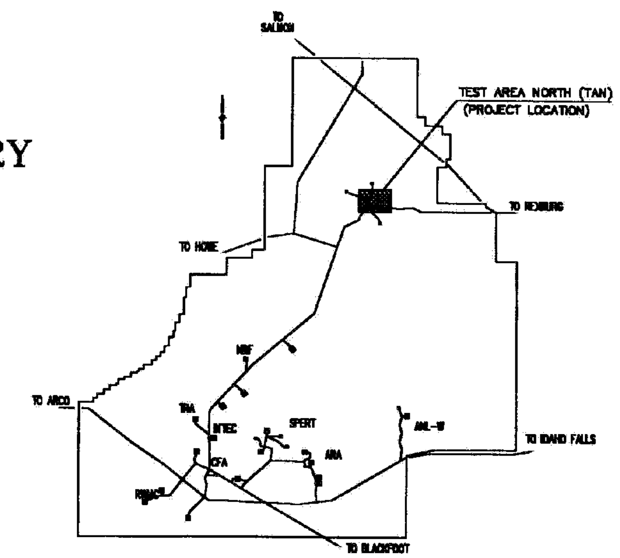
Snow and Ice

In addition to excess water collection, snow and ice sliding off the roof of the NPTF have damaged the pipe insulation on the northwest side of the building. To protect the pipe and insulation, Zeston 2000 PVC jacketing (see attached catalog cuts) shall be installed on all pipe runs located under the dripline of the NPTF building.

10151

U.S. DEPARTMENT OF ENERGY

IDAHO NATIONAL ENGINEERING & ENVIRONMENTAL LABORATORY
TEST AREA NORTH OU 1-07B
NEW PUMP & TREAT FACILITY (NPTF)
BUILDING TAN 1611
R A REPORT



VICINITY MAP

NOT TO SCALE

INDEX OF DRAWINGS

DWG NO	A/E SH NO	REV	TITLE
10300	G-1	A	TITLE SHEET
10301	G-2	A	SITE LAYOUT PLAN
10302	C-1	A	PLAN & PROFILE
10303	C-2	A	DETAILS
10304	A-1	A	BUILDING LAYOUT

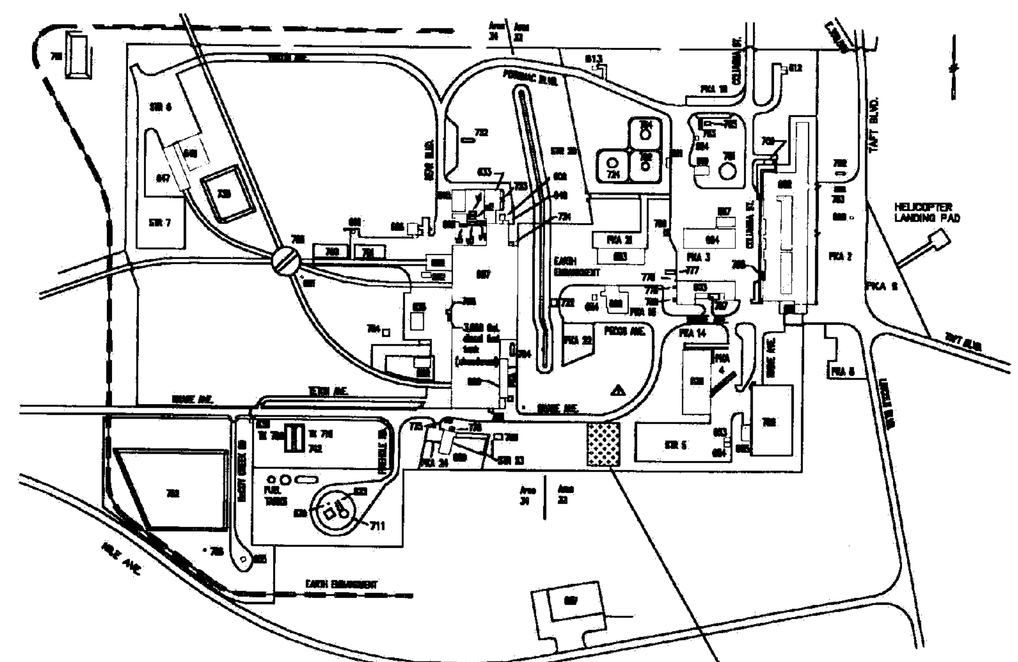
LEGEND

PIPING SYMBOLOGY

- PROCESS FLOW ARROW
- FLEXIBLE HOSE
- SP-X SAMPLE POINT

PIPE LINE DESIGNATIONS

- CWW - CONTAMINATED WELL WATER
- TW - TREATED WATER
- FW - FIRE WATER
- PW - POTABLE WATER



PROJECT LOCATION PLAN

SCALE: 1"=300'

NOTES

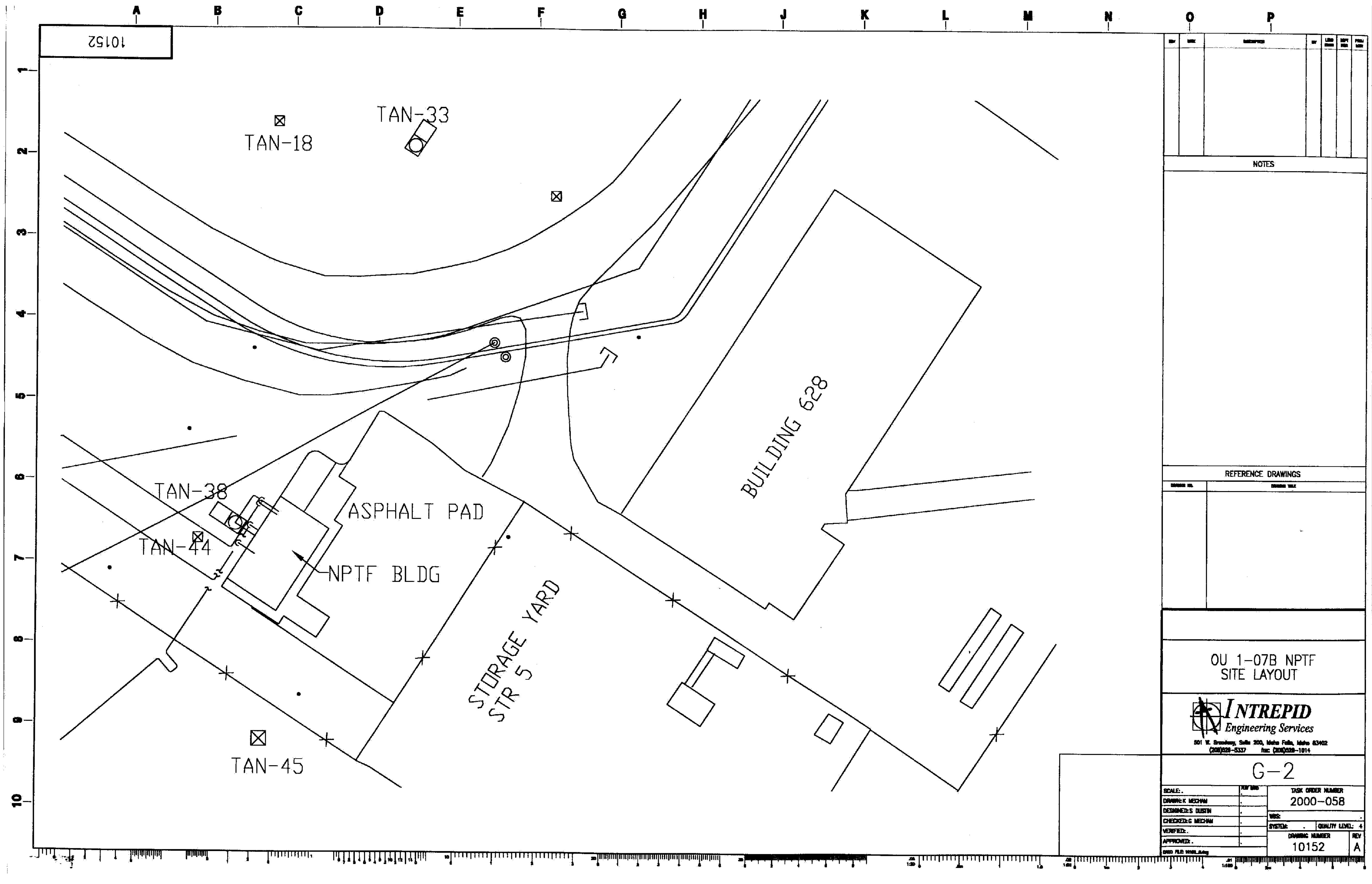
REFERENCE DRAWINGS

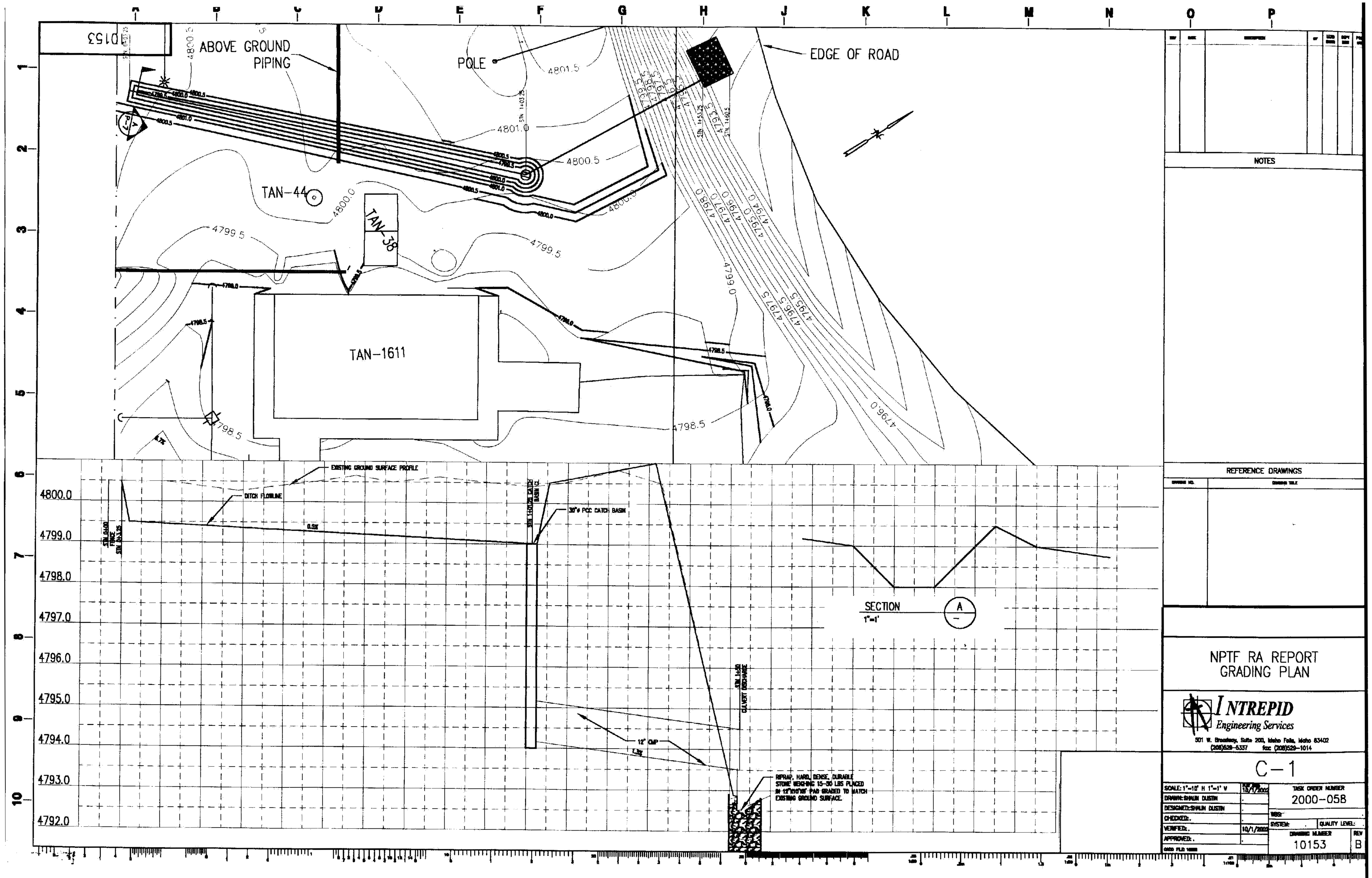
OU 1-07B NPTF
TITLE SHEET

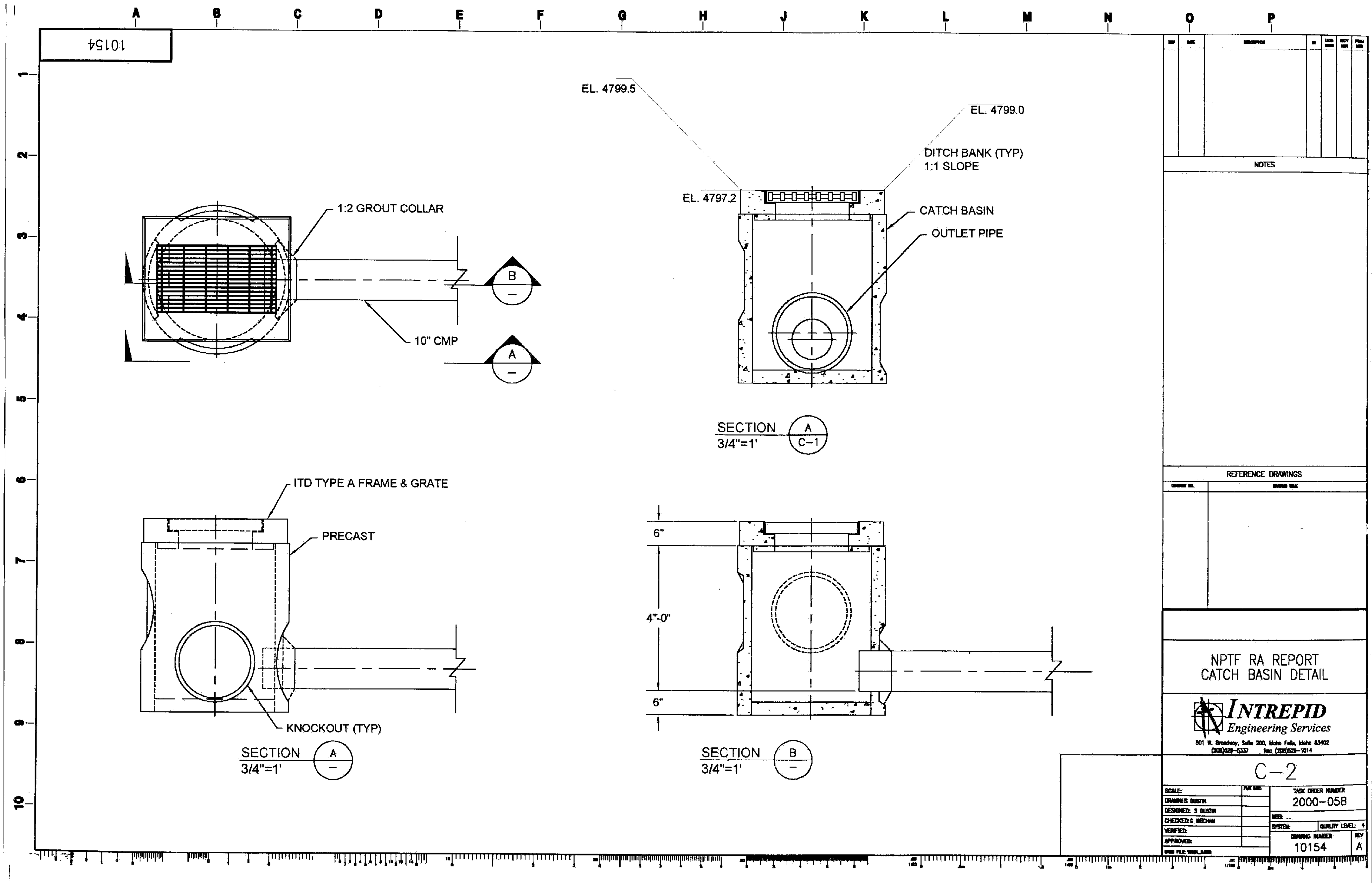
INTREPID Engineering Services

G-1

SCALE:		TASK ORDER NUMBER 2000-058
DRAWN: K MECHAM		
DESIGNED: S DUSTIN		WBS:
CHECKED: G MECHAM		SYSTEM: QUALITY LEVEL: 4
VERIFIED:		DRAWING NUMBER 10151 REV A
APPROVED:		


10152
TAN-18
TAN-33
BUILDING 628
ASPHALT PAD
TAN-38
TAN-44
NPTF BLDG
STORAGE YARD
STR 5
TAN-45
NOTES
REFERENCE DRAWINGS
OU 1-07B NPTF
SITE LAYOUT
INTREPID
Engineering Services
G-2
TASK ORDER NUMBER
2000-058
DRAWN: K. MECHAM
DESIGNED: S. DUSTIN
CHECKED: G. MECHAM
QUALITY LEVEL: 4
DRAWING NUMBER
10152
REV
A


EDGE OF ROAD
ABOVE GROUND PIPING
POLE
TAN-44
TAN-38
TAN-1611
4801.5
4801.0
4800.5
4800.0
4799.5
4798.5
4796.0
4795.5
4796.5
4797.5
EXISTING GROUND SURFACE PROFILE
DITCH FLOWLINE
30"ø PCC CATCH BASIN
12" CMP
RIPRAP, HARD, DENSE, DURABLE STONE WEIGHING 15-30 LBS PLACED IN 12"X10'X8' PAD GRADED TO MATCH EXISTING GROUND SURFACE.
CULVERT DISCHARGE
SECTION A
1"=1'
4800.0
4799.0
4798.0
4797.0
4796.0
4795.0
4794.0
4793.0
4792.0
NOTES
REFERENCE DRAWINGS
NPTF RA REPORT
GRADING PLAN
INTREPID
Engineering Services
C-1
SCALE: 1"=10' H 1"=1' V
DRAWN: SHAUN DUSTIN
DESIGNED: SHAUN DUSTIN
CHECKED:
VERIFIED:
APPROVED:
TASK ORDER NUMBER
2000-058
SYSTEM:
QUALITY LEVEL:
DRAWING NUMBER
10153
REV
B
10153


10154
EL. 4799.5
EL. 4799.0
DITCH BANK (TYP)
1:1 SLOPE
EL. 4797.2
CATCH BASIN
OUTLET PIPE
1:2 GROUT COLLAR
10" CMP
SECTION A C-1
3/4"=1'
ITD TYPE A FRAME & GRATE
PRECAST
KNOCKOUT (TYP)
SECTION A –
3/4"=1'
6"
4"-0"
6"
SECTION B –
3/4"=1'
NOTES
REFERENCE DRAWINGS
NPTF RA REPORT
CATCH BASIN DETAIL
INTREPID
Engineering Services
C-2
TASK ORDER NUMBER
2000-058
DRAWING NUMBER
10154
A

Johns Manville

Pipe & Equipment Insulations

Zeston® 2000 PVC

Insulated Fitting Covers and Jacketing

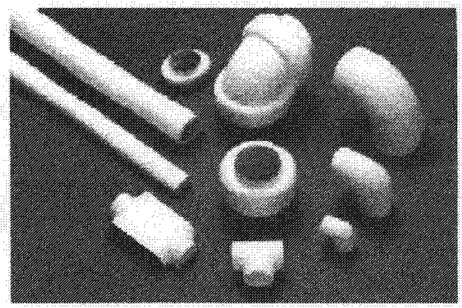
Description

Zeston 2000 fitting covers are designed to insulate, and to provide a protective covering for pipe fittings. The fitting covers are supplied with Hi-Lo® Temp fiber glass insulation inserts from the factory. Zeston 2000 PVC jacketing provides a protective covering for insulated or bare pipes. Zeston 2000 PVC fitting covers and jacketing are manufactured from high-impact, gloss white, UV-resistant, polyvinyl chloride which provides a simple, quickly installed system.

Fitting covers are available for the following: 45° and 90° (0.8 and 1.6 rad.) short and long radius elbows, tees and valves, flanges, reducers, end caps, soil pipe hubs, traps and mechanical groove-type fittings. Zeston 2000 PVC jacketing is available in rolls in thicknesses of 10, 15, 20 and 30 mil (0.3, 0.4, 0.5 and 0.8 mm). System 2000™ PVC Cut & Curled jacketing in thicknesses of 20 or 30 mil (0.5 mm or 0.8 mm) (30 mil [0.8 mm] recommended for outdoor applications) is available in factory-cut sizes to fit up to 30" (762 mm) O.D. All sections of System 2000 PVC Cut & Curled jacketing are 48" (1219 mm) in length and are factory curled to fit snugly.

Standard stock dimensions of Zeston 2000 PVC jacketing in rolls

Thickness		Width		Length		Area	
mil	mm	in.	mm	ft.	m	sq. ft.	m²
10	0.3	35½	902	203	62	600	56
15	0.4	35½	902	135	41	400	37
20	0.5	35½	902	102	31	300	28
20	0.5	48	1219	100	31	400	37
30	0.8	35½	902	67½	21	200	19
30	0.8	48	1219	67½	21	270	25



Operating Temperature Limits:
PVC: 0°F to 150°F (-18°C to +66°C)
Insert: 0°F to 450°F (-18°C to +232°C)
Flame Spread: 25 or less (up to 30 mil [0.8 mm])
Smoke Developed: 50 or less (up to 30 mil [0.8 mm])
Grade: Weatherable
Color: White
Finish: Gloss

Uses

Zeston PVC fitting covers and jacketing are ideally suited for indoor or outdoor use on chilled water, hot water, steam and other piping systems in commercial, institutional, and industrial applications. The fitting covers, when combined with Zeston 2000 PVC jacketing and Perma-Weld® Adhesive, form a completely sealed system which meets the requirements of the USDA and FDA for applications in food, beverage, and pharmaceutical facilities.

Physical properties of Zeston 2000 PVC

Property	Value	ASTM Test Method
Specific Gravity	1.48	D 792
Tensile Strength at Yield, psi (kPa)	6,000 (41,370)	D 638
Elongation at Yield (MD), %	3.0	D 638
Tensile Modulus, psi (kPa)	470,000 (3,240,650)	D 638
Flexural Strength, psi (kPa)	11,600 (79,982)	D 638 (min. .125" [3 mm] thick specimen)
Flexural Modulus, psi (kPa)	460,000 (3,171,700)	D 790
Flame Spread	25 or less (up to 30 mil [0.8 mm])	E 84
Smoke Developed	50 or less (up to 30 mil [0.8 mm])	E 84
Electrical Conductance	Non-Conductor	D 257
Gardner-SPI Impact, in. lb./mil by Ductile Failure	10 mil (0.3 mm) 1.3 15 mil (0.4 mm) 1.4 20 mil (0.5 mm) 1.5 30 mil (0.8 mm) 1.6	D 3679 (4 lb. [1.8 kg] weight; 8 lb. [3.6 kg] for 30 mil [0.8 mm])

Note: Data on chemical resistance is available on request.

CI-65 5-02 (Replaces 1-01)

Zeston® 2000 PVC

Insulated Fitting Covers and Jacketing

Qualifications for Use

Hot Systems

- PVC covers must be kept below 150°F (66°C) by use of proper insulation thickness.
- PVC covers should be kept away from contact with, or exposure to, sources of direct or radiated heat.
- For fittings where operating temperatures exceed 250°F (121°C), or where pipe insulation thickness is greater than 1½" (38 mm), two or more layers of Hi-Lo Temp insulation inserts are required beneath fitting cover.

Cold Systems

- An approved vapor retarder mastic compatible with PVC must be applied between pipe insulation and fitting cover, and on fitting cover throat overlap seam.
- For fittings where operating temperature is below 45°F (7°C) or where the pipe insulation thickness is greater than 1½" (38 mm), two or more layers of Hi-Lo Temp insulation inserts are required beneath fitting cover.

Refrigerant Systems and Cold Systems in Severe Ambient Conditions

- Mitered pipe insulation segments. Fabricated or premolded insulation shapes may be used in lieu of Hi-Lo Temp insulation inserts.
- An intermediate vapor retarder compatible with PVC is required to completely seal the insulation prior to installing the Zeston 2000 PVC fitting cover. Care should be taken to ensure that the vapor barrier mastic is applied between the pipe insulation and the fitting cover, and on fitting cover throat overlap seam.

Totally Sealed Systems (USDA Approval)

- System requires that 20 or 30 mil (0.5 mm or 0.8 mm) Zeston PVC jacketing is applied to pipe insulation in conjunction with Zeston PVC fitting covers.
- All circumferential and longitudinal seams of jackets and fitting covers should be sealed with Zeston Perma-Weld® adhesive. Circumferential seams should be a minimum 1" (25 mm) overlap, and longitudinal seams should be 1½" to 2" (38 mm to 51 mm) overlap.
- Upon completion, all seams should visually be checked for seal and touched up, if necessary.
- Slip joints are required periodically between fixed supports and on continuous long runs of straight piping. Slip joints are achieved by increasing circumferential overlap to 8 to 10 inches (203 mm to 254 mm) and applying a flexible white caulking in the overlap area to maintain a sealed system.

General properties of Hi-Lo Temp fiber glass insulation insert

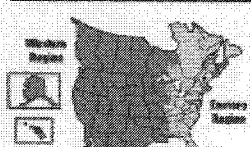
	Mean Temperature		"k"	
Thermal conductivity	°F	°C	Btu•in/(hr•ft²•°F)	W/m•°C
	75	24	.28	.040
	150	66	.34	.049
	300	149	.45	.065
Temperature limits	0°F to 450°F (-18°C to +232°C)			
Sanitary	Odorless. Will not absorb odors. Provides no food for insects, rodents, or mildew.			
Vibration resistant	Will not settle or separate.			
Fire safety	Meets most requirements of federal, state and local codes. Accepted for commercial, institutional, industrial, and residential projects in all parts of U.S. The fiber glass inserts have UL 25/50 rating and are non-combustible per ASTM E 136.			

Specification Compliance

USDA, Agriculture Canada
New York City MEA #7-87
ICBO
SBCCI
BOCA
ASTM D 1784, Class 16354-C
L-P-535E,* Composition A, Type II, Grade GU
L-P-1035A,* Composition A, Type II, Grade GU
Canada: CGSB 51-GP-53M;
CAN/ULC S102-M88

*Impact strength determined by Gardner SPI test method rather than Izod, since Gardner is more appropriate for PVC sheeting materials.

View MSDS



North American Sales Offices, Mechanical Insulations

Eastern Region
P.O. Box 158
Defiance, OH 43512
(419) 784-7000
(800) 334-2399
Fax: (419) 784-7866

Western Region
P.O. Box 5108
Denver, CO 80217
(303) 978-2284
(800) 368-4431
Fax: (303) 978-4661

Central and South America
(303) 978-4655
Fax: (303) 978-2627

Asia, Middle East and Europe
(303) 978-3310
Fax: (303) 978-2627

Johns Manville

Mechanical Insulations
P.O. Box 5108
Denver, CO 80217-5108
www.jm.com

CI-55 5-02 (Replaces 1-01)

The physical and chemical properties of Zeston® insulated fitting covers and jacketing represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Numerical flame spread and smoke developed ratings are not intended to reflect hazards presented by these or other materials under actual fire conditions. Check with the Regional Sales Office nearest you to assure current information. **All Johns Manville products are sold subject to Johns Manville's Limited Warranty and Limitation of Remedy. For a copy of the Johns Manville Limited Warranty and Limitation of Remedy, call the 800 number below.** For information on other Johns Manville thermal insulations and systems and a copy of the Spec-Line® CSI formatted specification, call **1-800-654-3103.** To access automated fax-on-demand service in the United States and Canada, simply call **1-888-INSULFX** (1-888-467-8539) from a phone or fax.

Appendix B

Well Safety Post


Figure B-1. Well TAN-37.

Figure B-2. Well TAN-42.